APR1400 HYDROLOGY AND METEOROLOGY CLARIFYING QUESTIONS

CLARIFYING QUESTIONS, DCD SECTION 2.3.1 AND ASSOCIATED SITE PARAMETERS

02.03.01-1: NUREG-0800, Section I, "Areas of Review," states that ambient temperature and humidity statistics (e.g., 2% and 1% annual exceedance and 100-year maximum dry bulb temperature and coincident wet bulb temperature; 2% and 1% annual exceedance and 100-year maximum wet bulb temperature (non-coincident); 98% and 99% annual exceedance and 100- year minimum dry bulb temperature) for use in establishing heat loads for the design of normal plant heat sink systems, post-accident containment heat removal systems, and plant heating, ventilating, and air conditioning systems should be provided. (Emphasis added)

APR1400 DCD Tier 2, Table 2.0-1, "Site Parameters," included HVAC Outdoor Design Temperatures for the 0%, 1%, and 5% exceedance values. Please update DCD Table 2.0-1 to clearly identify whether these are annual exceedance values or seasonal exceedance values.

Response: Table 2.0-1 will be updated to clearly identify the exceedance values.

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.01-1.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

02.03.01-2: APR1400 DCD Tier 2, Table 2.0-1, "Site Parameters," includes an ambient 5% exceedance value for circulating water system (CWS) of 0.1 °C (79 °F) non-coincident wet bulb. The staff believes this value of 0.1 °C to be a typographic error. Please update DCD Table 2.0-1 to correct this error.

Response: Table 2.0-1 will be updated to correct 1°C to 26.1°C.

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.01-2.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

02.03.01-3: APR1400 DCD Tier 2, Table 2.0-1, "Site Parameters," includes Ambient Design Temperature for Cooling Tower as a Site Parameter. The parameter values for this site parameter are broken into 3 separate rows in the table, making it confusing to determine what the site parameter and associated values are. For clarity, please update DCD Table 2.0-1 so that the 5%, maximum, and minimum values are in the same cell (as done for the HVAC Outdoor Design Temperature site parameters).

Response: Table 2.0-1 will be updated in a manner similar to that of the HVAC Outdoor Design Temperature site parameters.

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.01-3.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

02.03.01-4: APR1400 DCD Tier 1, Table 2.1-1, "Site Parameters," appears to include extraneous lines. For clarity, please remove the following:

1. The line between "1 % Exceedance Values" and "Maximum" under the heading of HVAC Outdoor Design Temperature.
2. The line between "0 % Exceedance Values (historical limit excluding peak <2 hours)" and "Maximum" under the heading of HVAC Outdoor Design Temperature.

Response: Table 2.1-1 will be updated to delete the extraneous lines.

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.01-4.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

02.03.01-5: APR1400 DCD Tier 2, Table 2.0-1, "Site Parameters," includes Extreme Wind as a site parameter. Please update the site parameter value to provide the exposure category as described and provided in DCD Section 3.3.1.1.

Response: As described in DCD Section 3.3.1.1, exposure category C is applied for the wind speed at 10m (33ft) above ground.

Impact on DCD
The DCD Tier 1 Table 2.1-1 and Tier 2 Table 2.0-1 will be revised as shown in DCD markup 02.03.01-5.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

02.03.01-6: NUREG-0800, Section I, "Areas of Review," states that ambient temperature and humidity statistics (e.g., 2% and 1% annual exceedance and 100-year maximum dry bulb temperature and coincident wet bulb temperature; 2% and 1% annual exceedance and 100-year maximum wet bulb temperature (non-coincident); 98% and 99% annual exceedance and 100- year minimum dry bulb temperature) for use in establishing heat loads for the design of normal plant heat sink systems, post-accident containment heat removal systems, and plant heating, ventilating, and air conditioning systems should be provided. (Emphasis added)

APR1400 DCD Tier 2, Table 2.0-1, "Site Parameters," includes Ambient Design Temperature for Cooling Tower as a Site Parameter. The term "non-concurrent" is used in three separate rows to describe the type of maximum or minimum wet bulb temperature applicable to the ambient design temperatures for the cooling tower, whereas the term "coincident" is used in the row above for use in the HVAC Outdoor Design Temperature site parameter. Please clarify the meaning of "non-concurrent" in the table or update DCD Table 2.0-1 if "non-coincident" was the intended term for wet bulb temperatures in order to maintain consistency with previous wet bulb temperature site parameters.

Response: The DCD will be updated to correct "non-concurrent" to "non-coincident".

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.01-6.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

02.03.01-7 APR1400 DCD Tier 2, Table 2.0-1, "Site Parameters," includes two rows, one labeled "Maximum" and the other labeled "Minimum," located beneath the row labeled "Ambient Design Temperature for Cooling Tower." It appears to the staff that the table was meant to be formatted in the same way as APR1400 DCD Tier 1, Table 2.1-1, "Site Parameters." Please update DCD Table 2.0-1 in order to clarify the placement of these particular temperatures with respect to the "Ambient 5% exceedance values for circulating water system" and "Ambient 0% exceedance values for essential service water system."

Response: The DCD will be updated to clarify design temperatures corresponding to the circulating and essential service water systems.

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.01-7.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

CLARIFYING QUESTIONS, DCD SECTION 2.3.4 AND ASSOCIATED SITE PARAMETERS

Short-Term Atmospheric Dispersion Estimates for Accident Releases

02.03.04-1: NUREG-0800, Section 2.3.4 states that "atmospheric dispersion factors used for the assessment of consequences related to atmospheric radioactive releases to the control room for design basis, other accidents, and for onsite and offsite releases of hazardous airborne materials should be provided."

APR1400 DCD Tier 2, Table 2.0-1, "Site Parameters," and DCD Tier 1, Table 2.1-1, "Site Parameters," do not include any control room atmospheric dispersion factors (χ/Q) for accident

dose analysis. Please update DCD Tier 2, Table 2.0-1 and Tier 1, Table 2.1-1 to include the control room atmospheric dispersion factors (χ/Q).

Response: The control room atmospheric dispersion factors (χ/Q) were provided in DCD Tier 2, Tables 2.3-2 through 2.3-12 only to avoid over-crowding and duplication of the information since the onsite χ/Qs include a large set of numbers compared to the other site parameters. KHNP recommends providing a reference to Tier 2 Tables 2.3-2 through 2.3-12 instead of including all χ/Qs in the Tier I and Tier II tables for site parameters. Refer to the attached DCD markup 02.03.04-1 that includes a reference to the tables that contain the atmospheric dispersion factors.

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.04-1.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

02.03.04-2: NUREG-0800, Section 2.3.4 states that "atmospheric dispersion factors used for the assessment of consequences related to atmospheric radioactive releases to the control room for design basis, other accidents, and for onsite and offsite releases of hazardous airborne materials should be provided." NUREG-0800 also states that "for control room habitability analysis, a site plan drawn to scale should be included showing true North and potential atmospheric accident release pathways, control room intake, and unfiltered inleakage pathways."

APR1400 DCD Tier 2 material includes tables and figures related to the determination of control room atmospheric dispersion factors (χ/Q) for accident dose analysis. Please address the following staff question:

1. DCD Tier 1, Tables 2.3-2 and 2.3-13 describe an intake location with the title of "MCR Roof Centerline." Please explain why this intake is included in these tables, as it is not included as an intake in DCD Figure 2.3-1.

Response: KHNP understands that this item relates to Tier 2, Tables 2.3-2 and 2.3-13. The control room atmospheric dispersion factor (χ/Q) for "MCR Roof Centerline" is used to calculate the external gamma dose in the MCR from the semi-infinite cloud located above the MCR roof. This information will be included in Figure 2.3-1 for consistency

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.04-1.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

2. If the "MCR Roof Centerline" is intended to be used as an intake, please update Figure 2.3-1 to include it as an intake location point.

Response: DCD Figure 2.3-1 will be updated to include the MCR Roof Centerline as an intake point with an added explanation. Refer to Point 5 in the attached markup 02.03.04-2.

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.04-2.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

3. DCD Tier 2, Tables 2.3-2, 2.3-3, and 2.3-13 include the Reactor Containment Building (RCB) as a vent source. DCD Figure 2.3-1 does not include the Reactor Containment Building as a vent point. Please update DCD Figure 2.3-1 to include the Reactor Containment Building as a vent point (see AP1000, Tier 2, Figure 15A-1 and Table 15A-7 (Source 8) as an example of an acceptable way to include the containment shell as a source)

Response: DCD Figure 2.3-1 will be updated to include the containment surface as a diffuse area source. Refer to the Point 15 in the attached markup 02.03.04-2.

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.04-2.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

02.03.04-3: APR1400 DCD Tier 2, Table 2.3-13 (1 of 6), "Design Input for ARCON96 Calculation," includes a parameter for the Meteorological Data with a value of Prairie Island (1993-1997). Please explain why "Prairie Island (1993-1997)" is included in this table. If this is a typographic error, please update the table to remove this value.

Response: KHNP conducted an analysis to establish a conservative basis for the onsite χ/Qs for the APR1400 DC application to support the control room habitability analyses. All publicly available meteorological data in the NRC ADAMS database for Alternative Source Term license amendment submittals were collected for the analysis. The meteorological data for six (6) U.S. sites, namely San Onofre (Pacific Ocean), Hope Creek (Delaware River), Prairie Island (Mississippi River), Quad Cities (Mississippi River), Limerick (Schuylkill River), and J.A FitzPatrick (Lake Ontario) were formatted for the ARCON96 calculations. Using these data and the APR1400 design-specific source-receptor design parameters, a sensitivity analysis was performed to identify the most conservative data for the control room habitability analysis. As a result, it was found that the 5-year meteorological data for Prairie Island measured during 1993 – 1997 would bound the data of the other five sites, with a 50% margin applied, to attain the resulting onsite χ/Qs. The source of the data was therefore referenced in Table 2.3-13 (1 of 6). KHNP will revise Tier 2 Table 2.3-16 to provide a non-plant specific reference. Refer to the attached DCD markup 02.03.04-3.

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.04-3.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

02.03.04-4: NUREG-0800, Section 2.3.4 states that "for control room habitability analysis, a site plan drawn to scale should be included showing true North and potential atmospheric accident release pathways, control room intake, and unfiltered inleakage pathways."

APR1400 DCD Tier 2, Figure 2.3-1 lists the MCR North Intake and South Intake as intake points 1 and 2, respectively. However, in the accompanying figure, the dashed outline of MCR contains intake points 3 and 4. Please confirm if this figure is correct. If the figure is mislabeled, please correct Figure 2.3-1 in the next revision of the DCD.

Response: Intake points 1 and 2 in Figure 2.3-1 are the north and south intake locations of the MCR envelope. The intake points 3 and 4 are those used for the Auxiliary Building HVAC

systems. Figure 2.3-1 will be revised to separate the dashed outline from points 3 and 4 to avoid misunderstanding.

Impact on DCD
The DCD will be revised as shown in DCD Tier 2 markup 02.03.04-2.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

CLARIFYING QUESTIONS, DCD SECTION 2.3.5 AND ASSOCIATED SITE PARAMETERS

Long-Term Dispersion Estimates for Routine Releases

02.03.05-1: APR1400 Section 2.3.5, "Long-Term Atmospheric Dispersion Estimates for Routine Releases," states, "For conservative estimates of radioactive decay, a half-life of 2.26 days (Xe-133m) is acceptable for short-lived noble gases, and a half-life of 8 days (I-131) for all iodine released to the atmosphere is acceptable, as addressed in NRC RG 1.111 (Reference 8)." However, Tier 2, Table 1.9-1 (15 of 38) states that NRC RG 1.111 is not applicable to this DCD. Please clarify why RG 1.111 is not applicable even though it is referenced in DCD Section 2.3.5. If necessary, update Table 1.9-1.

Response: KHNP used an undecayed and undepleted χ/Q value of 2.0E-05 sec/m^3 to bound the χ/Q values for typical U.S. sites (Ginna, Cook, Kewaunee, and Point Beach) and the two recent license applications (US EPR and US-APWR), instead of direct calculation of the χ/Q values based on the methods described in RG 1.111. Therefore, the APR1400 DCD notes that NRC RG 1.111 is not applicable in Table 1.9-1.

KHNP also used the decayed and/or depleted χ/Q values for the calculation of offsite doses in accordance with NRC RG 1.109, in which half-lives of 2.26 and 8 days for noble gases and iodines were extracted from RG 1.111. RG 1.111 was therefore referenced in DCD Tier 2 Section 2.3.5 for the source of data. The overall methodology in RG 1.111, which is applicable where site-specific meteorological data are available, is not applied to the APR1400 DC application.

Impact on DCD
There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

HYDROLOGY

1. Please discuss where the 'safety-related water service system' discussion is located in the FSAR.

Response: The safety-related water service system is addressed in DCD section 9.2.

Impact on DCD
There is no impact on the DCD.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

2. Regarding the source term to be used in the accidental contaminant transport analysis; where is the discussion/table containing this information located in the FSAR?

Response: Discussion on compliance with the guidance in BTP 11-6 and the radionuclide concentration limits in 10 CFR 20, Appendix B due to an accidental release of liquid effluents is described in DCD Tier 2 Subsection 11.2.3.2 as referenced in Subsection 2.4.13. This analysis is based on a postulated failure of CVCS Holdup Tank. The associated source terms and the consequences are presented in Table 11.2-9.

Impact on DCD
There is no impact on the DCD.

Impact on PRA
There is no impact on the PRA.

Impact on Technical Specification
There is no impact on the Technical Specification.

Impact on Technical/Topical/Environmental Report
There is no impact on any Technical, Topical and Environmental Reports.

Table 2.0-1 (1 of 4)

Site Parameters

Parameter Description	Parameter Value
Maximum Elevation of Groundwater	0.61 m (2 ft) below plant grade [(1)] in the vicinity of the SSCs important to safety
Maximum Flood Elevation	0.30 m (1 ft) below plant grade in the vicinity of the SSCs important to safety
Precipitation - Maximum precipitation rate (1 mi^2) - 100-year snowpack roof load - Extreme winter precipitation roof load - Depth of 48-hour probable maximum winter precipitation (PMWP)	 492.7 mm (19.4 in) over 1 hour 157 mm (6.2 in) in 5 minutes 2.873 kPa (60 lbf/ft^2) 5.985 kPa (125 lbf/ft^2) 914.4 mm (36 in)
HVAC Outdoor Design Temperature - 5 % exceedance values · Maximum annual · Minimum annual - 1 % exceedance values · Maximum annual · Minimum annual - 0 % exceedance values (historical limit excluding peaks < 2 hours) · Maximum annual · Minimum annual	 35 °C (95 °F) dry bulb and 25 °C (77 °F) coincident wet bulb -20.6 °C (-5 °F) 43.3 °C (100 °F) dry bulb and 25 °C (77 °F) coincident wet bulb –23.3 °C (–10 °F) 46.1 °C (115 °F) dry bulb and 26.7 °C (80 °F) coincident wet bulb –40 °C (–40 °F)
Ambient Design Temperature for Cooling Tower - Ambient 5 % exceedance values for circulating water system (CWS) · Maximum annual · Minimum annual	 .1 °C (79 °F) non-concurrent wet bulb –20.6 °C (-5 °F) 26.1 °C (79 °F) non-concurrent wet bulb –20.6 °C (-5 °F) 27.2 °C (81 °F) non-concurrent wet bulb

Table 2.0-1 (1 of 4)

Site Parameters

Parameter Description	Parameter Value
Maximum Elevation of Groundwater	0.61 m (2 ft) below plant grade [(1)] in the vicinity of the SSCs important to safety
Maximum Flood Elevation	0.30 m (1 ft) below plant grade in the vicinity of the SSCs important to safety
Precipitation - Maximum precipitation rate (1 mi^2) - 100-year snowpack roof load - Extreme winter precipitation roof load - Depth of 48-hour probable maximum winter precipitation (PMWP)	 492.7 mm (19.4 in) over 1 hour 157 mm (6.2 in) in 5 minutes 2.873 kPa (60 lbf/ft^2) 5.985 kPa (125 lbf/ft^2) 914.4 mm (36 in)
HVAC Outdoor Design Temperature - 5 % exceedance values · Maximum · Minimum - 1 % exceedance values · Maximum · Minimum - 0 % exceedance values (historical limit excluding peaks < 2 hours) · Maximum · Minimum	 35 °C (95 °F) dry bulb and 25 °C (77 °F) coincident wet bulb -20.6 °C (-5 °F) 43.3 °C (100 °F) dry bulb and 25 °C (77 °F) coincident wet bulb –23.3 °C (–10 °F) 46.1 °C (115 °F) dry bulb and 26.7 °C (80 °F) coincident wet bulb –40 °C (–40 °F)
Ambient Design Temperature for Cooling Tower - Ambient 5 % exceedance values for circulating water system (CWS)	 .1 °C (79 °F) non-concurrent wet bulb –20.6 °C (-5 °F)
· Maximum	26.1 °C (79 °F) non-concurrent wet bulb –20.6 °C (-5 °F)
· Minimum	27.2 °C (81 °F) non-concurrent wet bulb
Ambient Design Temperature for Cooling Tower - Ambient 5 % annual exceedance values for circulating water system (CWS) · Maximum · Minimum	 26.1 °C (79 °F) non-coincident wet bulb -20.6 °C (-5 °F)

annual

Table 2.0-1 (2 of 4)

Parameter Description	Parameter Value
- Ambient 0 % exceedance values for essential service water system (ESWS) · Maximum · Minimum	27.2 °C (81 °F) non-coincident wet bulb –40.0 °C (–40 °F)
Extreme Wind - 50-year 3-second wind gust speed - Importance factor	 64.8 m/s (145 mph) 1.15 (2)
Tornado Parameters - Maximum horizontal wind speed - Translational speed - Rotational speed - Radius of maximum rotational speed - Maximum pressure differential - Rate of pressure drop - Missile spectra	 102.8 m/s (230 mph) 20.6 m/s (46 mph) 82.2 m/s (184 mph) 45.7 m (150 ft) 8.274 kPa (1.2 psi) 3.447 kPa/s (0.5 psi/s) Table 2 (Region I) of NRC RG 1.76 (Reference 1)
Hurricane Parameters - Maximum 3-second wind gust speed - Missile spectra	 116 m/s (260 mph) Table 1 of NRC RG 1.221 (Reference 2)
Accident Release χ/Q Values at exclusion area boundary (EAB) · 0-2 hr	 1.00×10^{-3} s/m^3
Accident Release χ/Q Values at low-population zone (LPZ) · 0-8 hr · 8-24 hr · 24-96 hr · 96-720 hr	 2.20×10^{-4} s/m^3 1.60×10^{-4} s/m^3 1.00×10^{-4} s/m^3 8.00×10^{-5} s/m^3
Annual Average χ/Q Values at Site Boundary · Undepleted/no decay · Undepleted/2.26-day decay · Depleted/8.00-day decay · Relative deposition factor (D/Q)	 2.00×10^{-5} s/m^3 1.99×10^{-5} s/m^3 1.84×10^{-5} s/m^3 2.00×10^{-7} 1/m^2
Inventory of radionuclides that could seep into the groundwater	See Table 11.2-9
Safe Shutdown Earthquake (SSE)	0.3 g peak ground acceleration

Table 2.1-1 (1 of 3)

Site Parameters

Ground Water	
Maximum Elevation of Groundwater	0.61 m (2 feet) below plant grade(1) in the vicinity of the SSCs important to safety
Flood (or Tsunami) Level	
Maximum Flood Elevation	0.3 m (1 foot) below plant grade in the vicinity of the SSCs important to safety
Precipitation	
Maximum Precipitation Rate [1 mi^2] 100-Year Snowpack Roof Load Extreme Winter Precipitation Roof Load Depth of 48-Hour Probable Maximum Winter Precipitation (PMWP)	- 492.7 mm (19.4 in) over 1-hour - 157 mm (6.2 in) in 5 minutes - 2.873 kPa (60 lbf/ft^2) - 5.985 kPa (125 lbf/ft^2) - 914.4 mm (36 in)
Design Ambient Temperatures	
HVAC Outdoor Design Temperature - 5 % exceedance values · Maximum · Minimum - 1 % Exceedance Values	 35 °C (95 °F) dry bulb and 25 °C (77 °F) coincident wet bulb -20.6 °C (-5 °F)
· Maximum · Minimum	43.3 °C (100 °F) dry bulb and 25 °C (77 °F) coincident wet bulb -23.3 °C (-10 °F)
- 0 % Exceedance Values (historical limit excluding peaks < 2 hours)	
· Maximum · Minimum	46.1 °C (115 °F) dry bulb and 26.7 °C (80 °F) coincident wet bulb -40.0 °C (-40 °F)
Ambient Design Temperature for Cooling Tower - Ambient 5 % Exceedance Values for CWS · Maximum · Minimum - Ambient 0 % Exceedance Values for ESWS · Maximum · Minimum	 26.1 °C (79 °F) non-concurrent wet bulb -20.6 °C (-5 °F) 27.2 °C (81 °F) non-concurrent wet bulb -40.0 °C (-40 °F)
Extreme Wind	
50-Year 3-Second Wind Gust Speed	64.8 m/s (145 mph)
Importance Factors	1.15 (2)

annual

non−coincident

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Table 2.1-1 (1 of 3)

Site Parameters

Ground Water	
Maximum Elevation of Groundwater	0.61 m (2 feet) below plant grade(1) in the vicinity of the SSCs important to safety
Flood (or Tsunami) Level	
Maximum Flood Elevation	0.3 m (1 foot) below plant grade in the vicinity of the SSCs important to safety
Precipitation	
Maximum Precipitation Rate [1 mi^2]	- 492.7 mm (19.4 in) over 1-hour - 157 mm (6.2 in) in 5 minutes
100-Year Snowpack Roof Load	- 2.873 kPa (60 lbf/ft^2)
Extreme Winter Precipitation Roof Load	- 5.985 kPa (125 lbf/ft^2)
Depth of 48-Hour Probable Maximum Winter Precipitation (PMWP)	- 914.4 mm (36 in)
Design Ambient Temperatures	
HVAC Outdoor Design Temperature - 5 % exceedance values · Maximum · Minimum	35 °C (95 °F) dry bulb and 25 °C (77 °F) coincident wet bulb -20.6 °C (-5 °F)
- 1 % Exceedance Values · Maximum · Minimum	43.3 °C (100 °F) dry bulb and 25 °C (77 °F) coincident wet bulb -23.3 °C (-10 °F)
- 0 % Exceedance Values (historical, including peaks < 2 hours) · Maximum · Minimum	46.1 °C (115 °F) dry bulb and 26.7 °C (80 °F) coincident wet bulb -40.0 °C (-40 °F)
Ambient Design Temperature for Cooling Tower - Ambient 5 % Exceedance Values for CWS · Maximum · Minimum - Ambient 0 % Exceedance Values for ESWS · Maximum · Minimum	 26.1 °C (79 °F) non-concurrent wet bulb -20.6 °C (-5 °F) 27.2 °C (81 °F) non-concurrent wet bulb -40.0 °C (-40 °F)
Extreme Wind	
50-Year 3-Second Wind Gust Speed	64.8 m/s (145 mph)
Importance Factors	1.15 (2)

annotation: annual

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annotation: annual

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Table 2.0-1 (2 of 4)

Parameter Description	Parameter Value
- Ambient 0 % exceedance values for essential service water system (ESWS) · Maximum · Minimum	 –40.0 °C (–40 °F)
Extreme Wind - 50-year 3-second wind gust speed - Importance factor	 64.8 m/s (145 mph) ; exposure category C 1.15 (2)
Tornado Parameters - Maximum horizontal wind speed - Translational speed - Rotational speed - Radius of maximum rotational speed - Maximum pressure differential - Rate of pressure drop - Missile spectra	 102.8 m/s (230 mph) 20.6 m/s (46 mph) 82.2 m/s (184 mph) 45.7 m (150 ft) 8.274 kPa (1.2 psi) 3.447 kPa/s (0.5 psi/s) Table 2 (Region I) of NRC RG 1.76 (Reference 1)
Hurricane Parameters - Maximum 3-second wind gust speed - Missile spectra	 116 m/s (260 mph) Table 1 of NRC RG 1.221 (Reference 2)
Accident Release χ/Q Values at exclusion area boundary (EAB) · 0-2 hr	 1.00×10^{-3} s/m^3
Accident Release χ/Q Values at low-population zone (LPZ) · 0-8 hr · 8-24 hr · 24-96 hr · 96-720 hr	 2.20×10^{-4} s/m^3 1.60×10^{-4} s/m^3 1.00×10^{-4} s/m^3 8.00×10^{-5} s/m^3
Annual Average χ/Q Values at Site Boundary · Undepleted/no decay · Undepleted/2.26-day decay · Depleted/8.00-day decay · Relative deposition factor (D/Q)	 2.00×10^{-5} s/m^3 1.99×10^{-5} s/m^3 1.84×10^{-5} s/m^3 2.00×10^{-7} 1/m^2
Inventory of radionuclides that could seep into the groundwater	See Table 11.2-9
Safe Shutdown Earthquake (SSE)	0.3 g peak ground acceleration

Table 2.1-1 (1 of 3)

Site Parameters

Ground Water	
Maximum Elevation of Groundwater	0.61 m (2 feet) below plant grade(1) in the vicinity of the SSCs important to safety
Flood (or Tsunami) Level	
Maximum Flood Elevation	0.3 m (1 foot) below plant grade in the vicinity of the SSCs important to safety
Precipitation	
Maximum Precipitation Rate [1 mi^2] 100-Year Snowpack Roof Load Extreme Winter Precipitation Roof Load Depth of 48-Hour Probable Maximum Winter Precipitation (PMWP)	- 492.7 mm (19.4 in) over 1-hour - 157 mm (6.2 in) in 5 minutes - 2.873 kPa (60 lbf/ft^2) - 5.985 kPa (125 lbf/ft^2) - 914.4 mm (36 in)
Design Ambient Temperatures	
HVAC Outdoor Design Temperature - 5 % exceedance values · Maximum · Minimum - 1 % Exceedance Values	 35 °C (95 °F) dry bulb and 25 °C (77 °F) coincident wet bulb -20.6 °C (-5 °F)
· Maximum · Minimum	43.3 °C (100 °F) dry bulb and 25 °C (77 °F) coincident wet bulb -23.3 °C (-10 °F)
- 0 % Exceedance Values (historical limit excluding peaks < 2 hours)	
· Maximum · Minimum	46.1 °C (115 °F) dry bulb and 26.7 °C (80 °F) coincident wet bulb -40.0 °C (-40 °F)
Ambient Design Temperature for Cooling Tower - Ambient 5 % Exceedance Values for CWS · Maximum · Minimum - Ambient 0 % Exceedance Values for ESWS · Maximum · Minimum	 26.1 °C (79 °F) non-concurrent wet bulb -20.6 °C (-5 °F) 27.2 °C (81 °F) non-concurrent wet bulb -40.0 °C (-40 °F)
Extreme Wind	
50-Year 3-Second Wind Gust Speed	64.8 m/s (145 mph)
Importance Factors	1.15 (2)

; exposure category C

Table 2.1-1 (3 of 3)

Soil Properties (Cont'd)	
Backfill Material Dynamic Properties (Minimum Damping Ratio, %) - Shear Strain • 1% • 0.1% • 0.01% • 0.001% • 0.0001%	 24 16 6 2 1
Strain-compatible Minimum Shear-wave velocity of Backfill	510 fps
Seismology	
Safe Shutdown Earthquake (SSE)	0.3g peak ground acceleration
Certified Seismic Design Response Spectra (CSDRS) Referencing SSE	See Figures 2.1-1 and 2.1-2
Hard Rock High Frequency (HRHF) Response Spectra(4)	0.46g peak ground acceleration See Figures 2.1-3 and 2.1-4
Meteorology	
Accident Release χ/Q Values at EAB · 0-2 hr	 1.00×10^{-3} s/m^3
Accident Release χ/Q Values at LPZ · 0-8 hr · 8-24 hr · 24-96 hr · 96-720 hr	 2.20×10^{-4} s/m^3 1.60×10^{-4} s/m^3 1.00×10^{-4} s/m^3 8.00×10^{-5} s/m^3
Meteorology (Cont'd)	
Annual Average χ/Q Values at Site Boundary · Undepleted/No Decay · Undepleted/2.26-Day Decay · Depleted/8.00-Day Decay · D/Q	 2.00 × 10-5 s/m^3 1.99 × 10-5 s/m^3 1.84 × 10-5 s/m^3 2.00 × 10-7 /m^2
Inventory of Radionuclides Which Could Potentially Seep into the Groundwater	See Table 2.1-2

(1) Plant grade represents the level of ground adjacent to the nuclear island buildings and is established plant elevation of 98 ft 8 in.

(2) 100-year recurrence interval; value to be used for design of seismic Category I and II structures only.

(3) Bearing capacity is defined at the foundation level of the Nuclear Island Structures.

(4) The HRHF response spectra are provided for evaluation of site-specific ground motion response spectra which exceed the CSDRS in the high frequency range at hard rock sites.

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Control Room Atmospheric Dispersion Factors (χ/Q)	See Tier 2, Table 2.3-2 through Table 2.3-12

Table 2.0-1 (2 of 4)

Parameter Description	Parameter Value
- Ambient 0 % exceedance values for essential service water system (ESWS) · Maximum · Minimum	 –40.0 °C (–40 °F)
Extreme Wind - 50-year 3-second wind gust speed - Importance factor	 64.8 m/s (145 mph) 1.15 (2)
Tornado Parameters - Maximum horizontal wind speed - Translational speed - Rotational speed - Radius of maximum rotational speed - Maximum pressure differential - Rate of pressure drop - Missile spectra	 102.8 m/s (230 mph) 20.6 m/s (46 mph) 82.2 m/s (184 mph) 45.7 m (150 ft) 8.274 kPa (1.2 psi) 3.447 kPa/s (0.5 psi/s) Table 2 (Region I) of NRC RG 1.76 (Reference 1)
Hurricane Parameters - Maximum 3-second wind gust speed - Missile spectra	 116 m/s (260 mph) Table 1 of NRC RG 1.221 (Reference 2)
Accident Release χ/Q Values at exclusion area boundary (EAB) · 0-2 hr	 1.00×10^{-3} s/m^3
Accident Release χ/Q Values at low-population zone (LPZ) · 0-8 hr · 8-24 hr · 24-96 hr · 96-720 hr	 2.20×10^{-4} s/m^3 1.60×10^{-4} s/m^3 1.00×10^{-4} s/m^3 8.00×10^{-5} s/m^3
Annual Average χ/Q Values at Site Boundary · Undepleted/no decay · Undepleted/2.26-day decay · Depleted/8.00-day decay · Relative deposition factor (D/Q)	 2.00×10^{-5} s/m^3 1.99×10^{-5} s/m^3 1.84×10^{-5} s/m^3 2.00×10^{-7} 1/m^2
Inventory of radionuclides that could seep into the groundwater	See Table 11.2-9
Safe Shutdown Earthquake (SSE)	0.3 g peak ground acceleration
Control Room Atmospheric Dispersion Factors (χ/Q)	See Table 2.3-2 through Table 2.3-12

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Replace this with "A"

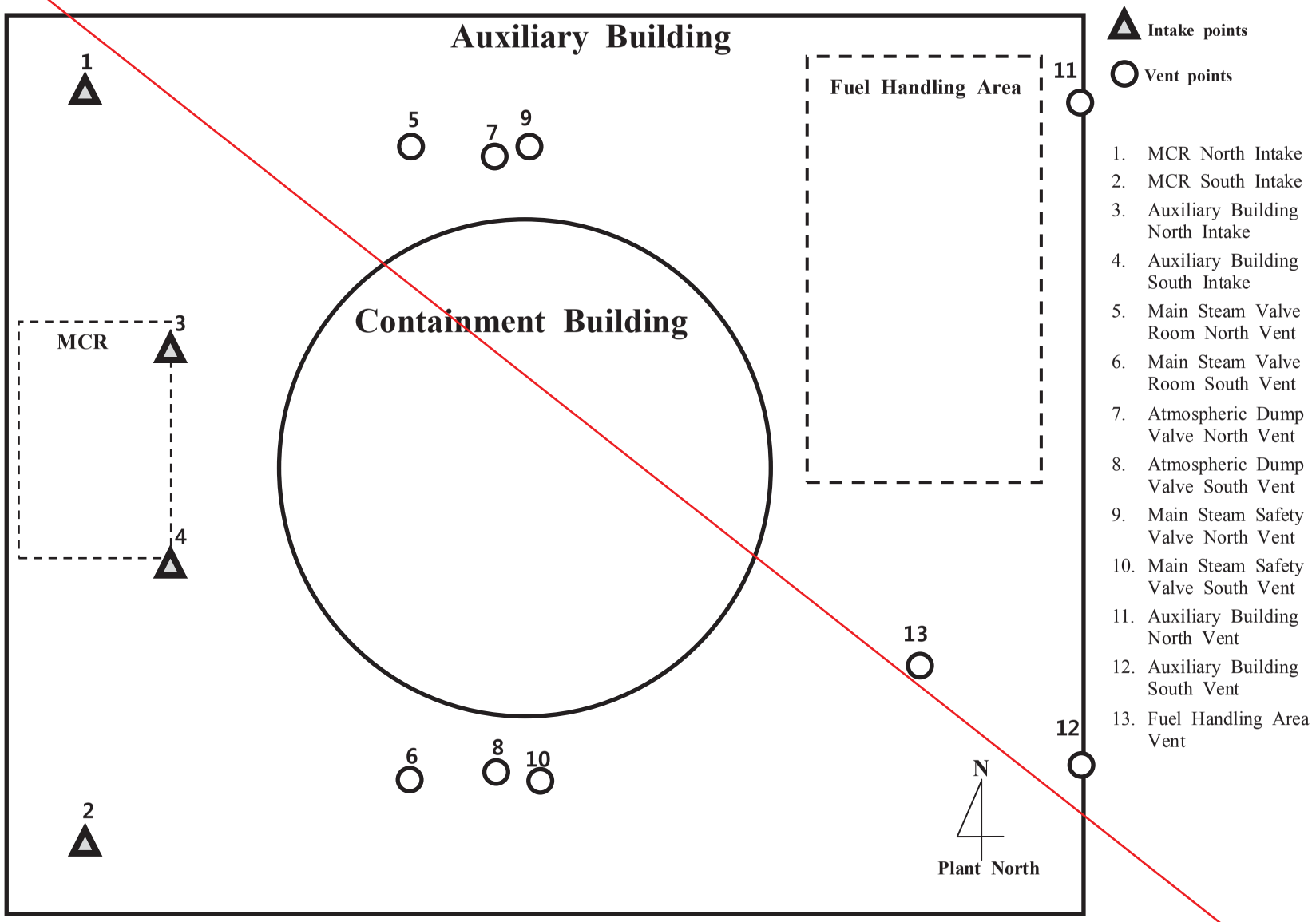
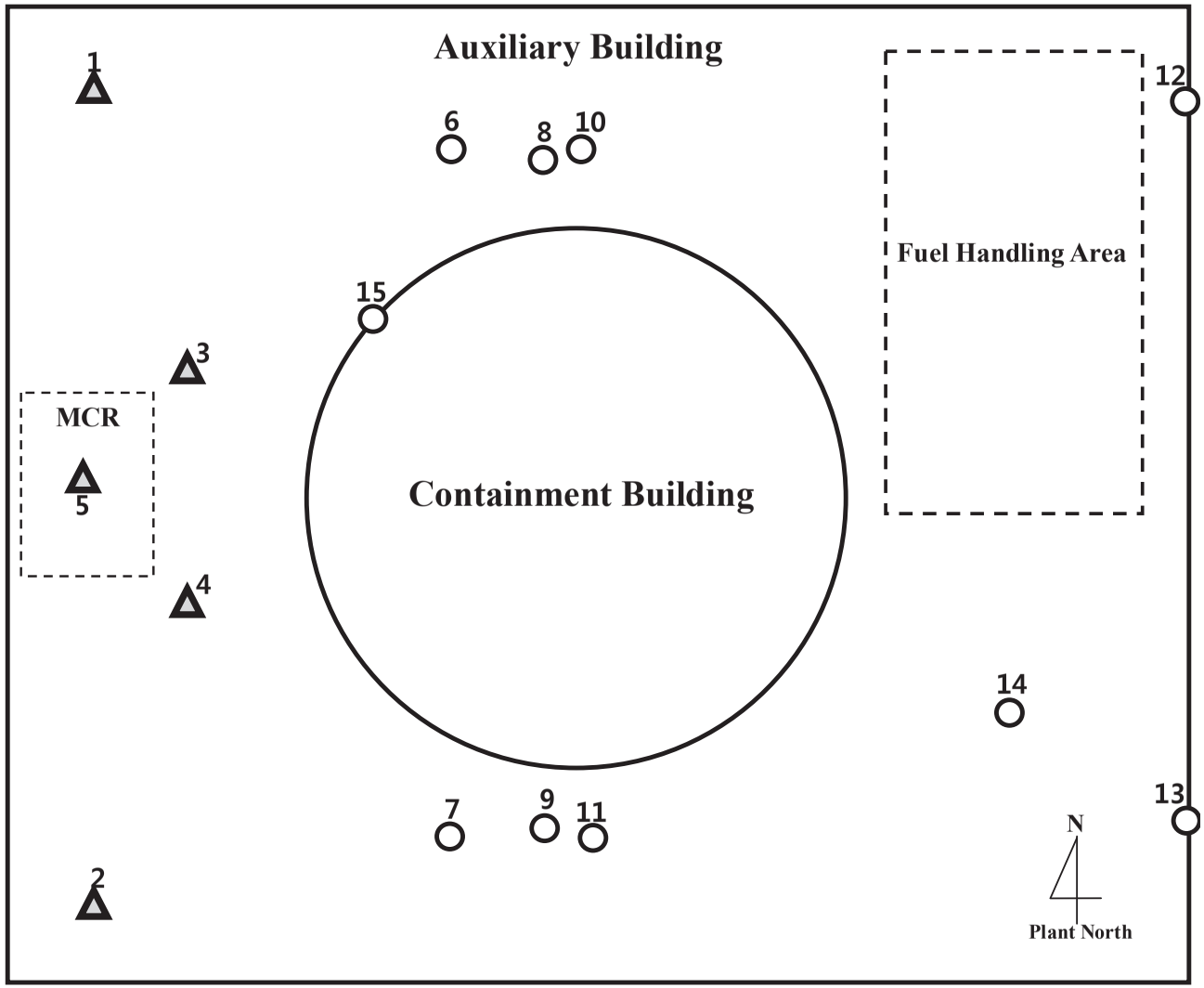


Figure 2.3-1 Locations of Post-accident Gaseous Vents and Intakes



Intake points (Receptors)

Release points (Sources)

1. MCR North Intake
2. MCR South Intake
3. Auxiliary Building North Intake
4. Auxiliary Building South Intake
5. MCR Roof Centerline (Used for external dose from cloud shine)
6. Main Steam Valve Room North Vent
7. Main Steam Valve Room South Vent
8. Atmospheric Dump Valve North Vent
9. Atmospheric Dump Valve South Vent
10. Main Steam Safety Valve North Vent
11. Main Steam Safety Valve South Vent
12. Auxiliary Building North Vent
13. Auxiliary Building South Vent
14. Fuel Handling Area Vent
15. Containment Building Surface (Used as a diffuse area source)

Figure 2.3-1 Locations of Post-accident Gaseous Releases and Intakes

Table 2.3-13 (1 of 6)

Design Input for ARCON96 Calculation

Bounding data for six U.S. sites(1)

Parameter		Value
Meteorological Data		~~Prairie Island (1993–1997)~~
Source Release Category		
< From >	< To >	< Source Type >
Reactor Containment Building	MCR Intakes MCR Roof Centerline Auxiliary Building Intakes	Diffuse area source Diffuse area source Diffuse area source
North and South Main Steam Valve Room	MCR Intakes Auxiliary Building Intakes	Ground level point sources Ground level point sources
North and South Atmospheric Dump Valves	MCR Intakes	Ground level point sources
North and South Main Steam Valves	MCR Intakes	Ground level point sources
North Auxiliary Building South Auxiliary Building South Auxiliary Building	MCR Intakes MCR Intakes Auxiliary Building Intakes	Ground level point sources Ground level point sources Ground level point sources
Fuel Handling Area	MCR Intakes	Ground level point sources
MCR Intake (Receptor)		
Characteristics MCR intakes MCR roof Auxiliary building intakes (infiltration path way) Reduction of χ/Qs MCR intakes Auxiliary building intakes (infiltration path way)		 Dual MCR intakes Single point at roof center Dual AB intakes Factor of 8 Factor of 2

Table 2.3-13 (6 of 6)

Parameter	Value
Intake Height from Ground Level	
MCR intakes	25.8 m
MCR roof centerline	24.4 m
Auxiliary building intakes (infiltration path way)	32.0 m
Surface Roughness Length	0.2 m
Minimum Wind Speed	0.5 m/s
Average Sector Width Constant	4.3
Lower Measurement Height for Meteorological Data	10.0 m
Intermediate Measurement Height for Meteorological Data	60.0 m
Wind Speed Units for Meteorological Data	Miles per hour (mph)
Vertical Diffusion Area Coefficient (σ_{Z0})	
Reactor containment building – MCR intakes	0.0 m
Reactor containment building – MCR roof centerline	0.0 m
Reactor containment building – auxiliary building intakes	0.0 m
Horizontal Diffusion Area Coefficient[1] (σ_{Y0})	
Reactor containment building – MCR intakes	8.0 m
Reactor containment building – MCR roof centerline	8.0 m
Reactor containment building – auxiliary building intakes	8.0 m

(1) Width of Diffuse Area $\times \frac{1}{6}$: Horizontal diffusion area coefficients are calculated by this equation described in Reference 6.

(2)

(2)

Insert

(1) The χ/Q data were derived from an analysis using meteorological data from six U.S. sites: San Onofre (Pacific Ocean), Hope Creek (Delaware River), Prairie Island (Mississippi River), Quad Cities (Mississippi River), Limerick (Schuylkill River), and J. A. FitzPatrick (Lake Ontario). The meteorological data were formatted for an ARCON96 sensitivity analysis with the APR1400 design-specific source-receptor parameters in order to develop a set of conservative input values for the control room habitability analysis. The result of analysis shows that the five year meteorological data from Prairie Island measured during 1993~1997 bound the other site data when they are used with a margin of 50 percent for the resulting onsite χ/Qs. Therefore, this data is used as design input for the APR1400 ARCON96 calculation.